

4.8.1 INTRODUCTION

This section presents the fundamentals of environmental noise and vibration, the existing noise conditions at the project site and in its vicinity, the regulations that govern noise in the project area, the methodology used to conduct the noise impact analysis for the proposed project, and the potential stationary and mobile source noise impacts of the proposed project during its construction and occupancy. Where project noise impacts are found to be potentially significant, mitigation measures to reduce the magnitude of impacts are provided. Sources of information used in this noise impact analysis include the City of Santa Clara Environmental Quality Element, Santa Clara Municipal Code, and short- and long-term noise measurements taken on or near the project site in early 2008.

Public comments related to noise received in response to the Notice of Preparation for this Environmental Impact Report (EIR) are summarized below.

- A number of commenters were concerned with the amount of noise that will be generated during construction and demolition and requested provisions to mitigate the noise generated by trucks and equipment during demolition and construction.
- Several comments expressed concern regarding the increase in noise level associated with the density of the project. The commenters suggested restricting the number of units to reduce noise impacts. One commenter asked that everything possible should be considered for mitigation of noise impacts.
- At least one comment was concerned with noise from car and burglar alarms at night and one commenter requested that the EIR address the impacts associated with noise from air conditioning units.
- At least one commenter requested that the noise section address the potential for an echo effect from enclosed parking garages, which could worsen noise from vehicles.
- One commenter stated that there was a noise restriction for the neighborhood due to the fact that there was a hospital nearby. This restriction will no longer apply once the project moves forward.
- One commenter noted that noise from the project could affect the creek and an existing neighborhood area that has been there for almost 50 years.
- Commenters requested that on-site trees be preserved because they serve to attenuate noise for existing residences.
- A commenter noted that noise generated by higher buildings cannot be reduced by standard 8-foot sound walls.
- One commenter would like assurances that the City will strictly enforce code requirements regarding construction hours and noise. A number of commenters requested that additional limits beyond the

provisions within the City of Santa Clara Municipal Code be placed on construction/demolition times to 8 hours per day, 5 days a week. The commenters requested that the City restrict all construction vehicles from using Pepper Tree Lane during project construction.

- Several commenters requested that the setback from the residences along Marietta Drive be increased by 60 feet and suggested that trees be planted between the fences of Marietta Drive lots and the planned 2-story single-family houses. The commenters also requested that the height of the new retaining walls on the southern boundary of the site be disclosed in the EIR.

These scoping comments are addressed in the impact analysis presented below and also reflected in the analysis of alternatives in **Section 5.0, Alternatives**, in this EIR. Note that no retaining walls are proposed as part of the project. An existing 8-foot wooden wall along the southern boundary would remain in place. Although trees do not reduce noise, trees will be retained along the southern boundary of the site. With respect to the scoping comment regarding the noise restriction for the neighborhood due to the presence of a hospital, please note that that restriction stopped applying to the project area once the hospital was vacated by Kaiser Permanente. The proposed project is not the impetus for the removal of the restriction.

4.8.2 FUNDAMENTALS OF NOISE AND VIBRATION

4.8.2.1 Noise

Noise is usually defined as unwanted sound. It is an undesirable by-product of society's normal day-to-day activities. Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm, and/or when it has adverse effects on health. The definition of noise as unwanted sound implies that it has an adverse effect on people and their environment.

Noise is measured on a logarithmic scale of sound pressure level known as a decibel (dB). The human ear does not respond uniformly to sounds at all frequencies; for example, it is less sensitive to low and high frequencies than it is to the medium frequencies that more closely correspond to human speech. In response to the sensitivity of the human ear to different frequencies, the A-weighted noise level (or scale), which corresponds more closely with people's subjective judgment of sound levels, has been developed. This A-weighted sound level, referenced in units of dB(A), is measured on a logarithmic scale such that a doubling of sound energy results in a 3.0 dB(A) increase in noise level. In general, changes in a noise level of less than 3.0 dB(A) are not typically noticed by the human ear (US Department of Transportation 1980). Changes in noise ranging from 3.0 to 5.0 dB(A) may be noticed by some individuals who are extremely sensitive to changes in noise. A greater than 5.0 dB(A) increase is readily noticeable, while the human ear perceives a 10.0 dB(A) increase in sound level to be a doubling of sound.

Noise sources occur in two forms: (1) point sources, such as stationary equipment or individual motor vehicles; and (2) line sources, such as a roadway with a large number of point sources (motor vehicles). Sound generated by a point source typically diminishes (attenuates) at a rate of 6.0 dB(A) for each doubling of distance from the source to the receptor at acoustically “hard” sites and 7.5 dB at acoustically “soft” sites (US Department of Transportation 1980a).¹ For example, a 60 dB(A) noise level measured at 50 feet from a point source at an acoustically hard site would be 54 dB(A) at 100 feet from the source and 48 dB(A) at 200 feet from the source. Sound generated by a line source typically attenuates at a rate of 3.0 dB(A) and 4.5 dB(A) per doubling of distance from the source to the receptor for hard and soft sites, respectively (US Department of Transportation 1980a). Sound levels can also be attenuated by man-made or natural barriers (e.g., sound walls, berms, ridges), as well as elevational differences, as illustrated in **Figure 4.8-1, Noise Attenuation by Barriers**.

Wall/berm combinations may reduce noise levels by as much as 10.0 dB(A) depending on their height and distance relative to the noise source and the noise receptor (US Department of Transportation 1980b). Sound levels may also be attenuated 3.0 to 5.0 dB(A) by a first row of houses and 1.5 dB(A) for each additional row of houses (Barry and Reagan 1978). The minimum noise attenuation provided by typical building construction in California is provided in **Table 4.8-1, Outside to Inside Noise Attenuation**.

Table 4.8-1
Outside to Inside Noise Attenuation (dB(A))

Building Type	Open Windows	Closed Windows
Residences	17	25
Schools	17	25
Churches	20	30
Hospitals/Convalescent Homes	17	25
Offices	17	25
Theaters	20	30
Hotels/Motels	17	25

Source: Transportation Research Board, National Research Council, Highway Noise: A Design Guide for Highway Engineers, National Cooperative Highway Research Program Report 117.

When assessing community reaction to noise, there is an obvious need for a scale that averages varying noise exposures over time and that quantifies the result in terms of a single number descriptor. Several scales have been developed that address community noise level. Those that are applicable to this analysis are the Equivalent Noise Level (L_{eq}), the Day-Night Noise Level (L_{dn}), and the Community Noise

¹ Examples of “hard” or reflective sites include asphalt, concrete, and hard and sparsely-vegetated soils. Examples of acoustically “soft” or absorptive sites include soft, sand, plowed farmland, grass, crops, heavy ground cover, etc.

Equivalent Level (CNEL). L_{eq} is the average A-weighted sound level measured over a given time interval. L_{eq} can be measured over any time period, but is typically measured for 1-minute, 15-minute, 1-hour, or 24-hour periods. L_{dn} is a 24-hour L_{eq} with a “penalty” of 10 decibels added during the nighttime hours (10:00 PM to 7:00 AM), which is normally sleeping time. CNEL is another average A-weighted sound level measured over a 24-hour time period. However, the CNEL noise scale is adjusted to account for some individuals’ increased sensitivity to noise levels during the evening as well as the nighttime hours. A CNEL noise measurement is obtained after adding a “penalty” of 5 decibels to sound levels occurring during the evening from 7 PM to 10 PM, and 10 decibels to sound levels occurring during the nighttime from 10 PM to 7 AM.²

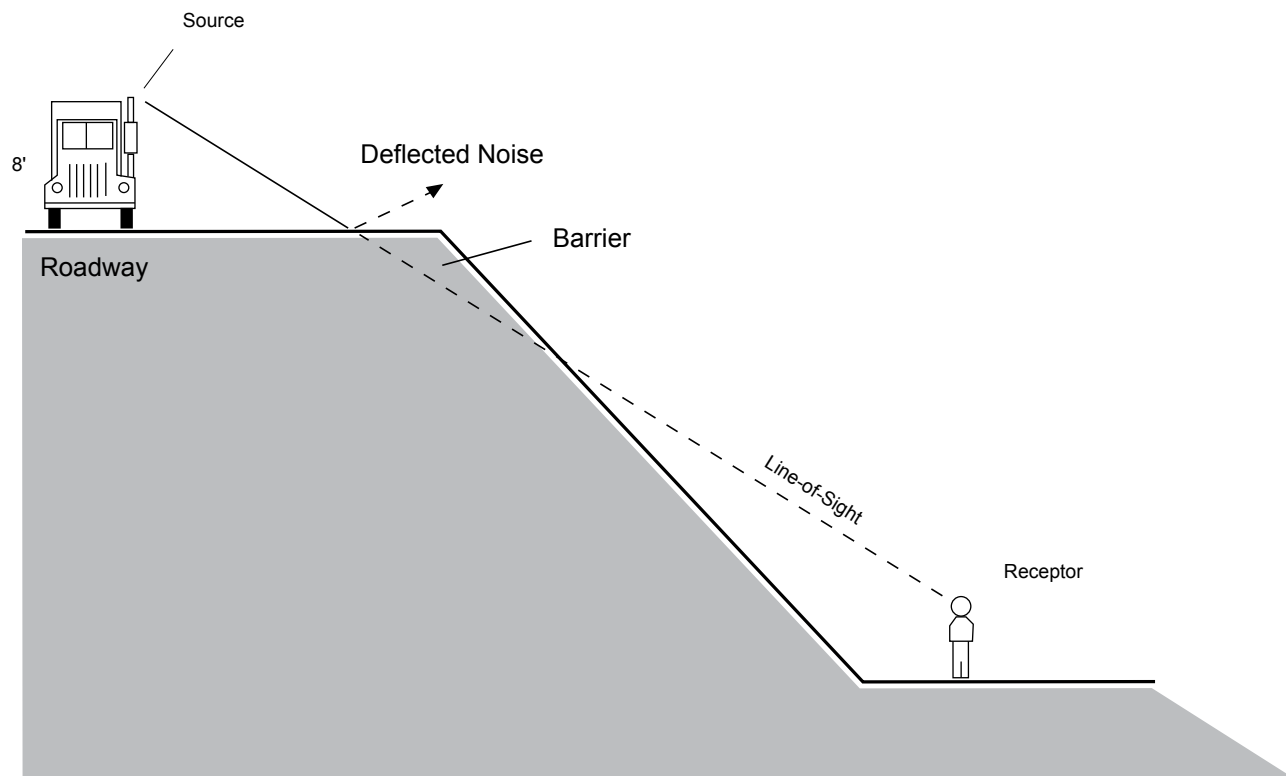
4.8.2.2 Vibration

Vibration of the air is called sound when it is within the frequency audible to the human ear, while vibration of materials other than air is called simply “vibration.” Vibration that travels through the earth is referred to as groundborne vibration. Airborne vibration is caused by low-frequency sound (less audible to the human ear) that can excite building components and create a feeling of vibration.

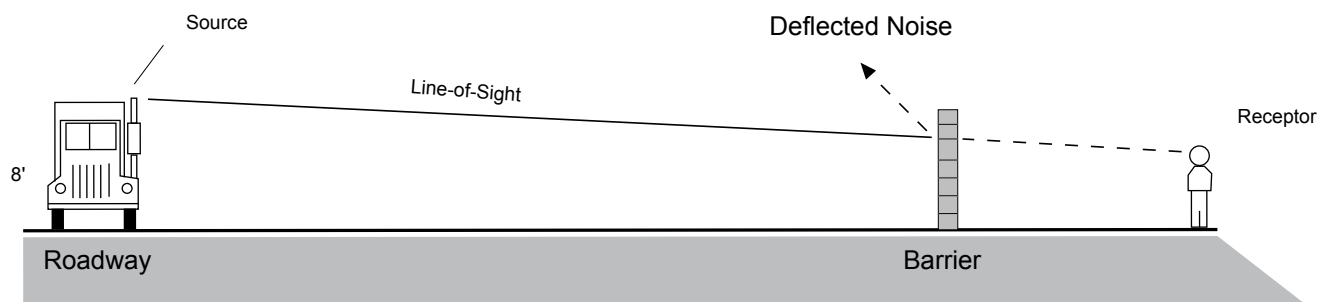
Vibration may be composed of a single pulse, a series of pulses, or a continuous oscillatory motion. The frequency of a vibrating object describes how rapidly it is oscillating, measured in Hz. Most environmental vibrations consist of a composite, or “spectrum” of many frequencies, and are generally classified as broadband or random vibrations. The normal frequency range of most perceptible vibration generally ranges from a low frequency of less than 1 Hz to a high of about 200 Hz. Vibration is often measured in terms of the peak particle velocity (PPV)³ in inches per second (in/sec) that correlates best with human perception. The threshold of perception for annoyance to humans is about 65 dB (referenced to 1 micro-inch per second). There is a high probability of annoyance if vibration velocities reach 85 dB (referenced to 1 micro-inch/sec) (US Department of Transportation 2006a).

² The logarithmic effect of adding these penalties to the peak-hour L_{eq} measurement results in a CNEL measurement that is within approximately 3 dB(A) (plus or minus) of the peak-hour L_{eq} . California Department of Transportation, *Technical Noise Supplement; A Technical Supplement to the Traffic Noise Analysis Protocol*, October 1998, pp. N51-N54.

³ Particle velocity is the velocity of a particle (real or imagined) in a medium as it transmits a wave.



"Barrier Effect" Resulting from Differences in Elevation.



"Barrier Effect" Resulting from Typical Soundwall.

SOURCE: Impact Sciences, Inc. – October 2004

FIGURE 4.8-1

Noise Attenuation by Barriers

Vibration energy spreads out as it travels through the ground, causing the vibration amplitude to decrease (attenuate) with distance from the source. High-frequency vibrations reduce much more rapidly than low frequencies, so that in the far-field from a source the low frequencies tend to dominate. An example of high frequency vibration would be ultrasound used in medicine, while sources of low frequency vibration would include pumps, boilers, electrical installations, fans, and road and rail traffic. Soil properties also affect the propagation of vibration. When groundborne vibration interacts with a building, there is usually a ground-to-foundation coupling loss, but the vibration can also be amplified by the structural resonances of the walls and floors. Vibration in buildings is typically perceived as rattling of windows or items on shelves, or the motion of building surfaces.

Groundborne vibration can be perceived without instrumentation within a few hundred feet of certain types of construction activities, especially pile driving. Road vehicles rarely create enough groundborne vibration to be perceptible to humans unless the road surface is poorly maintained and there are potholes or bumps. If traffic (typically heavy trucks) induces perceptible vibration in buildings, such as window rattling or shaking of small loose items, then it is most likely an effect of low-frequency airborne noise or ground characteristics.

Human annoyance by vibration is related to the number and duration of events. The more events or the greater the duration, the more annoying it will be to humans.

4.8.3 ENVIRONMENTAL SETTING

4.8.3.1 Project Site and Surrounding Land Uses

Existing On-Site Improvements

The project site was formerly occupied with a Kaiser Permanente hospital that has recently relocated to Lawrence Expressway and Homestead Road in Santa Clara. The following structures remain on site: an approximately 382,000-square-foot seven-story hospital building with seven floors above grade and one floor below grade, and nine single-story medical office/administrative buildings and four single-story mobile office/administrative trailers totaling approximately 79,700 square feet. Of these buildings, three single-story administrative buildings on Parcel 3, located north of Kaiser Drive, are currently in use, while the remainder of buildings on the site (on Parcels 1 and 2) are vacant. The rest of the site consists of paved (asphalt) parking lots and associated lighting, internal roadways, and vegetation. Parcels 1 and 2 were fenced off once the hospital vacated the site. No parking occurs on Parcels 1 and 2 at this time. Overhead wires run in a north-south direction near the center of the site. Mature stands of trees, including redwood species (*Sequoia sp*), Canary Island pine (*Pinus canariensis*), Chinese elms (*Ulmus*

parvifolia), and coast live oak (*Quercus agrifolia*), are present on the site, mainly in the southern portion of the site and along the southern facade of the main hospital building.

Surrounding Land Uses

In the vicinity of the project site, noise-sensitive receptors include single-family homes that border Saratoga Creek to the south of Parcels 1 and 2, single-family residences along Pepper Tree Lane west of Parcel 1, and condominiums to the north and west of Parcel 3. The San Jose International Airport (SJIA) is located approximately 2.5 miles from project site.

Ambient Noise Sources

Sources of noise audible on the project site include vehicular traffic along Kiely Boulevard and Pepper Tree Lane, as well as activities at existing residences located to its north, south, and west, and at the community park east of Kiely Boulevard. There are no ongoing noise sources on Parcels 1 and 2 at this time.

4.8.3.2 Noise Monitoring

Impact Sciences staff conducted both long- and short-term noise monitoring on the project site and its vicinity to quantify the existing ambient background noise levels (see **Figure 4.8-2, Noise Monitoring Locations**, for the monitoring locations). These measurements were taken on Tuesday, February 5, 2008 using Larson Model 720 sound level meters, which satisfy American National Standards Institute (ANSI) requirements for general environmental noise measurement instrumentation. The sound meters were equipped with an omni-directional microphone, calibrated before the day's measurements, and set at 5 feet above ground. The weather conditions were clear on the day the noise measurements were taken, with little to no wind.

Table 4.8-2, Monitored Noise Levels, identifies the locations and summarizes the results of the long- and short-term noise measurements.

On-Site Noise Measurements

One long-term (24-hour) noise measurement was taken on Parcel 2, approximately 48 feet away from the pavement of Pepper Tree Lane (Location 1). Recorded hourly noise levels ranged from 43 to 53 dB(A) L_{eq} , with a CNEL of 55 dB(A). Location 2 is on Parcel 2, south of the existing office buildings and approximately 190 feet away from Kiely Boulevard. The short-term noise measurement at this location was 62 dB(A) L_{eq} .

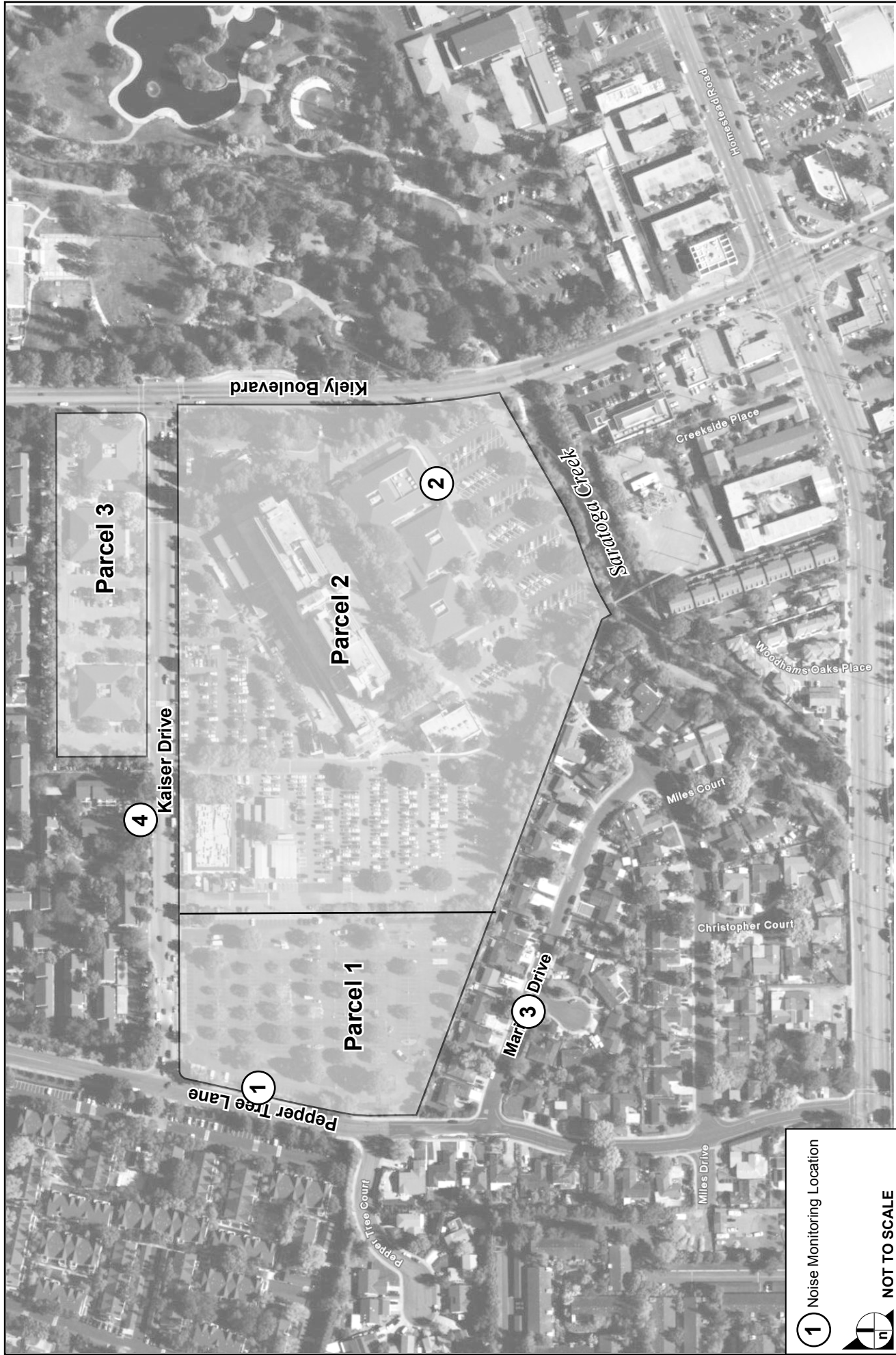


FIGURE 4.8-2
Noise Monitoring Locations

Off-Site Noise Measurements

Location 3 is within a single-family residential area along Marietta Drive where the short-term noise measurement was 50 dB(A) L_{eq} . Location 4 is in a multi-family residential area north of Kaiser Drive where the short-term noise measurement was 62 dB(A) L_{eq} .

Table 4.8-2
Monitored Noise Levels

Monitoring Location	Location Notes	dB(A), L_{eq} ¹
On-Site Noise Measurements		
1	Parcel 2, approximately 48 feet away from the pavement of Pepper Tree Lane	43-53 (55 dB(A) CNEL)
2	South of office buildings on Parcel 2, approximately 190 feet from Kiely Blvd.	62
Off-Site Noise Measurements		
3	Along Marietta Drive, south of Parcel 2	49
4	Along Kaiser Drive, west of Parcel 3 and north of Parcel 2	62

Source: Impact Sciences, Inc. Results of on-site monitoring are provided in **Appendix 4.8**.

¹ Results are rounded to the nearest decibel.

Project traffic would be distributed along a number of roadway segments in the project vicinity. Existing noise levels for noise-sensitive receptors along affected roadway segments in the project study area were modeled using the FHWA *Highway Noise Prediction Model*. The results of the modeling are provided in **Table 4.8-3, Existing Off-Site Noise Levels (Modeled based on 2008 volumes)**. Off-site noise modeling assumed that distances to the nearest noise receptors from the center line of the street are 50 feet. Traffic volumes, street widths, and speed limits were taken from the transportation impact analysis prepared for the proposed project (**Appendix 4.12**). Detailed model runs are provided in **Appendix 4.8** of this EIR.

The monitored noise levels, shown in **Table 4.8-2**, confirm the accuracy of the modeling results. Specifically, the long-term measurement on Pepper Tree Lane indicates that receptors within 50 feet of the street currently experience a noise level of about 55 dB(A) CNEL, which is close to but lower than the modeled noise level of 57 dB(A) CNEL. Therefore, the modeled noise levels are considered conservative and appropriate for the purposes of this study.

Table 4.8-3
Existing Off-Site Noise Levels (Modeled based on 2008 traffic volumes)

Roadway/Segment ¹	Noise-Sensitive Land Use	Noise Level CNEL ²
Homestead Road		
Pomeroy Avenue to Pepper Tree Lane	Residential	68.6
Pepper Tree Lane to Kiely Blvd.	Residential	68.0
Kaiser Drive		
w/o Kiely Boulevard	Residential	57.1
Kiely Boulevard		
Benton Street to El Camino Real	Residential	68.6
Kaiser Drive to Benton Street	Residential	68.3
Homestead Road to Kaiser Drive	Central Park	67.8
Pruneridge Avenue to Homestead Road	Residential	66.4
Pepper Tree Lane		
n/o Homestead Road	Residential	56.7

Source: Impact Sciences, Inc. (See **Appendix 4.8** for calculations)

¹ e/o = east of; w/o = west of; n/o = north of; s/o = south of

² Distances to noise-sensitive receptors from centerline of the street was assumed to be 50 feet for arterials and local residential streets. Locations further from the roadway would experience lower noise levels.

* Noise levels exceed normally acceptable noise exposure for residential uses along all roadways (55 dB(A) Ldn/CNEL).

4.8.4 REGULATORY CONSIDERATIONS

4.8.4.1 Local Plans and Policies

Plans and policies that pertain to the noise conditions in the project area include (1) Title 24, Noise Insulation Standards of the California Code of Regulations, (2) the State of California Department of Health Services, Environmental Health Division Guidelines for Noise and Land Use Compatibility, (3) the City of Santa Clara General Plan Environmental Quality Element, and (4) the City of Santa Clara Municipal Code. A description of these plans and policies, and how they relate to the proposed development are provided below.

Title 24, California Code of Regulations

The California Noise Insulation Standards of 1988 (California Code of Regulations Title 24, Section 3501 et seq.) require that interior noise levels from the exterior sources not exceed 45 dB(A) L_{dn}/CNEL⁴ in any

⁴ Measurements are based on Ldn or CNEL.

habitable room of a multi-residential use facility (e.g., hotels, motels, dormitories, long-term care facilities, and apartment houses and other dwellings, except detached single-family dwellings) with doors and windows closed. Where exterior noise levels exceed 60 dB(A) CNEL/L_{dn}, an acoustical analysis is required to show that the building construction achieves an interior noise level of 45 dB(A) CNEL/L_{dn} or less.

In unacceptable interior noise environments, additional noise insulation features, such as extra batting or resilient channels in exterior walls, double-paned windows, air conditioners to enable occupants to keep their windows closed without compromising their comfort, solid wood doors, noise baffles on exterior vents, and so forth are typically needed to provide acceptable interior noise levels. The best type of noise insulation is based on detailed acoustical analyses that identify all practical noise insulation features and that confirm their effectiveness.

California Government Code Section 63502(g)

The State of California Department of Health Services, Environmental Health Division, has published recommended guidelines for noise and land use compatibility referred to as the Guidelines for Noise and Land Use Compatibility (the State Guidelines). The State Guidelines, illustrated in **Figure 4.8-3, State Land Use Compatibility Guidelines for Noise**, indicate that residential land uses and other noise-sensitive receptors generally should be located in areas where outdoor ambient noise levels do not exceed 65 to 70 dB(A) (CNEL or L_{dn}). The Department of Health Services does not mandate application of this compatibility matrix to development projects; however, each jurisdiction is required to consider the State Guidelines when developing its general plan noise element and when determining acceptable noise levels within its community.⁵

Under the State Guidelines, an exterior noise level of 70 dB(A) L_{dn}/CNEL is typically the dividing line between an acceptable and unacceptable exterior noise environment for all noise-sensitive uses, including schools, libraries, churches, hospitals, day care centers, and nursing homes of conventional construction. Noise levels below 75 dB(A) L_{dn}/CNEL are typically acceptable for office and commercial buildings, while levels up to 80 dB(A) L_{dn}/CNEL are typically acceptable for industrial uses.

City of Santa Clara General Plan

Section 5.8, Noise, of the City of Santa Clara's General Plan Environmental Quality Element contains the City's guidelines for determining the compatibility of various land uses with different noise environments (see **Figure 4.8-4, City Noise and Land Use Compatibility Guidelines**). Generally, the

⁵ These Guidelines are also published by the Governor's Office and Planning and Research in the *State of California General Plan Guidelines* (2003).

compatible noise level for residential uses is 55 dB (A) L_{dn} /CNEL or less; noise levels ranging from over 55 dB(A) L_{dn} to 70 dB(A) L_{dn} in residential areas would require insulation or other measures to reduce interior noise levels. Noise levels above 70 dB(A) L_{dn} /CNEL are considered incompatible with residential uses. Because many areas of the City currently exceed the standards, particularly residential and educational uses, the noise compatibility chart is considered an objective towards which the City continues to work (City of Santa Clara 2002). The Environmental Quality Element defines noise-sensitive uses as those that include sleeping, convalescence, and teaching; therefore, residential sites and educational and medical facilities are the noise-sensitive areas of the City.

City of Santa Clara Municipal Code (Noise Ordinance)

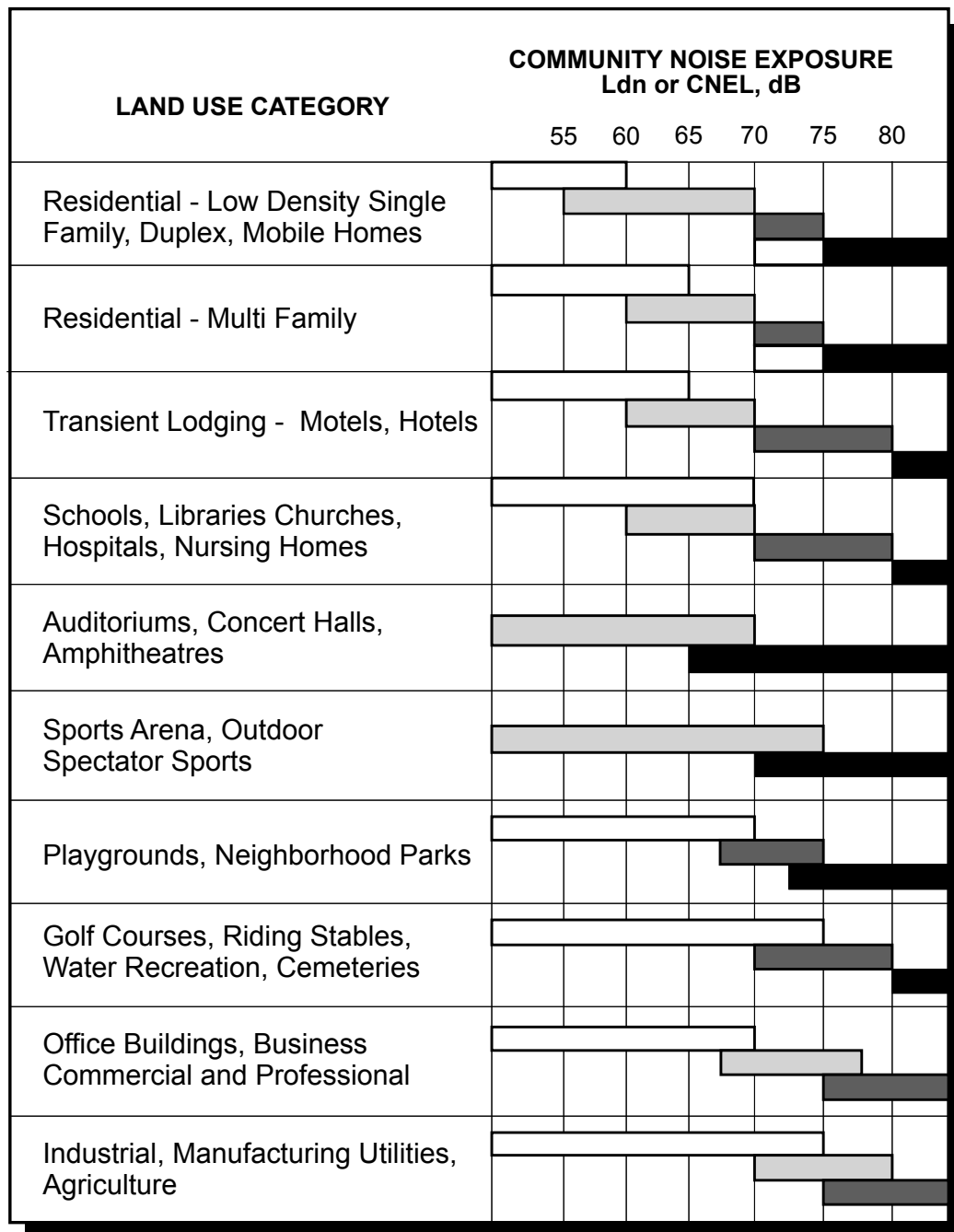
Chapter 9.10 of the City's Municipal Code governs noise and vibration within the City. Section 9.10.040 sets limits for permissible stationary source noise levels during the day and night depending on the zoning of the area. Noise standards that are applicable to the zoning of the project site and its vicinity are shown in **Table 4.8-4, City of Santa Clara Noise Ordinance Exterior Stationary Source Noise Limits**, below.

Table 4.8-4
City of Santa Clara Noise Ordinance Exterior Stationary Source Noise Limits

Zoning	Daytime (dBA)	Nighttime (dBA)
	7:00 AM to 10:00 PM	10:00 PM to 7:00 AM
Single-family and Duplex Residential (R1, R2)	55	50
Multi-family residential, public facility space (R3, B)	55	50

Source: Santa Clara Municipal Code, Chapter 9.10, Section 9.10.040, 2008

For construction/demolition noise, with certain exceptions, Section 9.10.230 of the Municipal Code prohibits construction-related activities within 300 feet of any residentially zoned property, except within the hours of 7:00 AM to 6:00 PM on weekdays other than holidays, and within the hours of 9:00 AM and 6:00 PM on any Saturday that is not a holiday.



- NORMALLY ACCEPTABLE**
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
- CONDITIONALLY ACCEPTABLE**
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
- NORMALLY UNACCEPTABLE**
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise reduction features included in the design.
- CLEARLY UNACCEPTABLE**
New construction or development should generally not be undertaken.

SOURCE: California Governor's Office of Planning and Research, State of California General Plan Guidelines, Appendix C: Guidelines for the Preparation and Content of Noise Elements of the General Plan, October 2003.

FIGURE 4.8-3

LEGEND

COMPATIBLE.



REQUIRE DESIGN & INSULATION TO REDUCE NOISE LEVELS.



INCOMPATIBLE. AVOID LAND USE EXCEPT WHEN ENTIRELY INDOORS AND AN INTERIOR NOISE LEVEL OF 45 Ldn CAN BE MAINTAINED.



HEARING DAMAGE POSSIBLE WITH LONG TERM EXPOSURE.



Ldn & CNEL	50	55	60	65	70	75	76	80	85
RESIDENTIAL	COMPATIBLE	COMPATIBLE	REQUIRE DESIGN & INSULATION TO REDUCE NOISE LEVELS	REQUIRE DESIGN & INSULATION TO REDUCE NOISE LEVELS	REQUIRE DESIGN & INSULATION TO REDUCE NOISE LEVELS	INCOMPATIBLE	INCOMPATIBLE	INCOMPATIBLE	INCOMPATIBLE
PUBLIC-EDUCATIONAL	COMPATIBLE	COMPATIBLE	REQUIRE DESIGN & INSULATION TO REDUCE NOISE LEVELS	REQUIRE DESIGN & INSULATION TO REDUCE NOISE LEVELS	REQUIRE DESIGN & INSULATION TO REDUCE NOISE LEVELS	INCOMPATIBLE	INCOMPATIBLE	INCOMPATIBLE	INCOMPATIBLE
RECREATIONAL	COMPATIBLE	COMPATIBLE	COMPATIBLE	COMPATIBLE	REQUIRE DESIGN & INSULATION TO REDUCE NOISE LEVELS	INCOMPATIBLE	INCOMPATIBLE	INCOMPATIBLE	INCOMPATIBLE
COMMERCIAL	COMPATIBLE	COMPATIBLE	COMPATIBLE	COMPATIBLE	REQUIRE DESIGN & INSULATION TO REDUCE NOISE LEVELS	INCOMPATIBLE	INCOMPATIBLE	INCOMPATIBLE	INCOMPATIBLE
INDUSTRIAL	COMPATIBLE	COMPATIBLE	COMPATIBLE	COMPATIBLE	REQUIRE DESIGN & INSULATION TO REDUCE NOISE LEVELS	INCOMPATIBLE	INCOMPATIBLE	INCOMPATIBLE	INCOMPATIBLE
OPEN SPACE	COMPATIBLE	COMPATIBLE	COMPATIBLE	COMPATIBLE	COMPATIBLE	COMPATIBLE	INCOMPATIBLE	INCOMPATIBLE	INCOMPATIBLE

Planning Division 3/91

SOURCE: City of Santa Clara - 2002

FIGURE 4.8-4

Section 9.10.050, which regulates vibration, states that it is unlawful for any fixed source of vibration to exceed the vibration perception threshold at the property line. Section 9.10.020 defines the “vibration perception threshold” as the minimum ground- or structure-borne vibrational motion necessary to cause a reasonable person of average sensitiveness to be aware of the vibration, by sensation by touch or visual observation of moving objects. This section further defines the threshold as a motion velocity of 0.01 inch/second over the range of 1 to 100 Hertz.

4.8.5 IMPACTS AND MITIGATION MEASURES

4.8.5.1 Significance Criteria

The impact of the proposed project related to noise would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the *State CEQA Guidelines*:

- Expose people to or generate noise levels in excess of standards established in any applicable plan or noise ordinance, or applicable standards of other agencies;
- Expose people to or generate excessive groundborne vibration or groundborne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in exposure of people residing or working in the project area to excessive noise levels if the project is located within an area covered by an airport land use plan, or where such a plan has not been adopted, within 2 miles of a public airport or public use airport; or
- Result in exposure of people residing or working in the project area to excessive noise levels if the project is located in the vicinity of a private airstrip.

The noise criteria from the general plan (**Figure 4.8-4**) are used in this analysis as thresholds to evaluate the significance of on-site noise impacts. Thresholds for off-site mobile source noise impacts were based on published guidance from the Federal Interagency Committee on Noise (FICON). The FICON recommendations are based on studies that related aircraft noise levels to the percentage of persons highly annoyed by the noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, in practice they have been applied to all sources of noise. The significance thresholds are presented in **Table 4.8-5, Noise Level Increase Required for Significant Impacts to Off-Site Receptors**, below.

According to **Table 4.8-5**, in areas where the ambient noise levels are less than 60 dB L_{dn} , an increase of 5 dB or more would be significant, whereas in areas where the ambient noise levels exceed 65 dB L_{dn} , an increase in the traffic noise level of 1.5 dB or more would be significant. The rationale for this sliding scale is that, as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause significant annoyance.

Table 4.8-5
Noise Level Increase Required for
Significant Impacts to Off-Site Receptors

Ambient Noise Level Without Project, L_{dn}	Increase Required for Significant Impact
< 60 dB	+ 5.0 dB or more
60-65 dB	+ 3.0 dB or more
> 65 dB	+1.5 dB or more

Source: FICON

There are no state standards for traffic-related vibrations and the California Department of Transportation's (Caltrans) position is that highway traffic and construction vibrations pose no threat to buildings and structures (Caltrans 2002). Section 9.10.020 of the City's Municipal Code defines "vibration perception threshold" as the minimum ground or structure-borne vibrational motion necessary to cause a reasonable person of average sensitiveness to be aware of the vibration, by sensation, by touch or visual observation of moving objects. This section further defines the threshold as a motion velocity of 0.01 inch/second over the range of 1 to 100 Hertz. Therefore, if a fixed source of vibration within the project site would cause an exceedance of this threshold, a significant vibration impact would occur.

4.8.5.2 Issues Not Discussed Further

The project site is not located within the vicinity of a private airstrip or a public/public use airport. The project site is located approximately 2.5 miles from the SJIA and is located outside the 65- to 70-decibel (dB) CNEL noise contour. The project site is not within the CNEL noise contour for referral to the Airport Land Use Commission, nor is it within the safety area designated for the SJIA for noise attenuation. Therefore, implementation of the project would neither impact nor be affected by significant aircraft noise. This issue is not discussed further in the analysis below.

4.8.5.3 Methodology

The primary concern in this impact analysis is the potential for proposed on-site and existing off-site noise-sensitive land uses to be exposed to noise levels that exceed adopted or recommended thresholds. The methodologies for determining point (stationary) and mobile source noise impacts, as well as vibration, are discussed below.

Point Source Noise

Determination of future point source noise levels on the project site and in its vicinity is based on available technical reports and literature that are cited throughout this EIR section. Point source noise associated with the project includes project construction, stationary equipment, and day-to-day activities at the site once the project is built out.

Mobile Source Noise

Mobile-source noise levels associated with the project under existing (2008) and future (2010) conditions were calculated using the Federal Highway Administration (FHWA) *Highway Traffic Noise Prediction Model* (FHWA-RD-77-108), which calculates the average noise level at specific locations based on traffic volumes, average speeds, roadway geometry, distances between the noise source and the receptor, and other noise-attenuating conditions. The average vehicle noise rates (energy rates) for California were also used in this modeling.

Vibration

Determination of potential vibration impacts associated with the proposed project is based on available technical reports and literature that are cited in this EIR section. Vibration that is potentially perceptible at the property line could occur during construction. Various types of construction equipment have been measured under a wide variety of construction activities; average source levels reported in terms of velocity levels are provided in **Table 4.8-6, Vibration Source Levels for Construction Equipment**. Although **Table 4.8-6** gives one level for each piece of equipment, it should be noted that there is a considerable variation in reported ground vibration levels from construction activities; nonetheless, the table provides a reasonable estimate for a wide range of soil conditions.

Table 4.8-6
Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft (in/sec)	Approximate VdB at 25 ft.
Pile Driver (impact)	upper range	1.518	112
	typical	0.644	104
Pile Driver (sonic)	upper range	0.734	105
	typical	0.170	93
Clam shovel drop (slurry wall)		0.202	94
Hydro mill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: Harris Miller Miller & Hanson, Inc., Noise and Vibration During Construction (www.hmmh.com/rail/ch12.pdf), p. 12-9. These data are based on US Department of Transportation, Federal Transit Administration, data (1995).

4.8.5.4 Project Impacts and Mitigation Measures

Impact NOISE-1: Future residents of the project site would not be exposed to noise from stationary sources on and off the site in excess of the City's noise standards. (Less than Significant)

Residents of the proposed development would generate and would be exposed to stationary source noise, including people talking, doors slamming, parking lot cleaning, air conditioning units, lawn care equipment, stereos, domestic animals, burglar alarms, and other common noise sources. These noise sources contribute to the ambient noise levels experienced in all similarly developed areas and they typically do not produce noise that exceeds the standards for the types of land uses proposed.

These noise levels could be considered an annoyance if they were to occur at odd hours (i.e., between 10:00 PM and 7:00 AM). However, most of these activities are not expected to occur at these hours, and would not typically exceed the City's noise standards discussed above in **subsection 4.8.4, Regulatory Considerations**. Noise from fixed sources such as air conditioning units is governed by Section 9.10.040 of the Municipal Code. Because the air conditioning units installed as part of the proposed project would be required by law to comply with the municipal code, the noise from these fixed sources would not

substantially increase ambient noise levels and the impact to on-site residents would be less than significant.

The project involves construction of multi-family apartment units in four-story buildings along Kiely Boulevard across from the Central Park on Parcels 1 and 2 and townhouses along Kiely Boulevard on Parcel 3. These apartments and townhouses would be exposed to noise from events and activities at the Central Park. Concerts, sporting events, and other events that generate noise are held on Central Park. Concerts at the Pavilion on Central Park are held about every month during the summer, while sporting events held at the International Swim Center and Sporting Center typically occur throughout the year. However, since these facilities are located about 600 feet and 1,000 feet, respectively, from the project site, noise levels from these activities would not cause an annoyance to on-site residents. Playground and passive recreational activities would occur within approximately 350 feet of the project site. However, the noise levels from these areas would not be so high as to affect the residents of the project site. The City permits group events and concerts to be held at the Arbor Center, which is about 200 feet from the project site and is the nearest point source of noise on Central Park. Concerts permitted at the Arbor Center are typically held in the daytime and on weekends about once every month during the summer. Apartment residents along Kiely Boulevard, especially those on the higher floors, could have direct lines of sight to point sources of noise from the Arbor Center in the park. Noise from these events at the Arbor Center could be considered an annoyance under Section 9.10.040 of the City's Municipal Code. However, sound from concerts held at the Arbor Center would be amplified north towards the audience seats, and would not be amplified towards Kiely Boulevard. Furthermore, the City restricts park activities that could result in unacceptable noise levels. Given the above, activities on Central Park would not result in significant noise impacts to future residents on the project site.

Mitigation Measure: No mitigation measures required.

Impact NOISE-2: Implementation of the proposed project would not expose future residents on the project site to noise from mobile sources in excess of the City's standards.
(Less than Significant)

New residences that are proposed closest to Kiely Boulevard, Kaiser Drive, and Pepper Tree Lane would be exposed to noise from mobile sources on these roadways. To evaluate this potential impact, ambient noise levels from traffic at project buildout on the following segments were modeled:

- **Pepper Tree Lane**, north of Homestead Road;
- **Kiely Boulevard**, between Homestead Road and Kaiser Drive; and
- **Kaiser Drive**, west of Kiely Boulevard.

The noise analysis assumed that the nearest on-site sensitive receptors would be approximately 50 feet away from the center line of each roadway. According to the model, the proposed residences along Pepper Tree Lane would experience a noise level of 58.3 dB(A) CNEL/L_{dn} under project conditions. Residences located along Kaiser Drive would experience a noise level of 60.7 CNEL/L_{dn}. Noise levels on the project site along Kiely Boulevard would be approximately 68.2 CNEL/L_{dn} at project buildout. Note that residents of townhouses and apartments immediately adjacent to the roadways (first row) would experience the highest noise levels, while those that are further away from the street would be shielded from traffic noise by the closer structures.

As shown in **Table 4.8-1**, typical building facades and design elements reduce interior noise from exterior levels by approximately 17 dB L_{dn} with windows open and 25 dB L_{dn} if windows are closed. With implementation of standard design measurements including HVAC systems, dual-pane windows, and construction of windows that open and close, residents of the apartments adjacent to Kiely Boulevard would experience interior noise levels of up to 43 dB L_{dn} with windows closed. Interior noise levels in homes along Kaiser Drive and Pepper Tree Lane would be even lower. Therefore, the project would not expose residents of the proposed development to noise levels in excess of the City's interior noise standards.

Exterior noise levels currently exceed and would continue to exceed the state and the City's exterior noise standard of 55 dB CNEL in portions of the proposed development along Kiely Boulevard, Kaiser Drive, and Pepper Tree Lane. Exterior areas between the first row of on-site residences and adjacent roadways are common areas that are not intended for outdoor use by residents. Therefore, even though the exterior noise levels in these areas would exceed 55 dB CNEL, the impact would not be considered significant. Those exterior areas of the proposed development that are intended for outdoor use are planned as courtyards and in locations where the noise exposure would be lower and no significant noise impacts in those areas would occur. In summary, the impact to on-site residents from mobile source noise would be less than significant.

Mitigation Measure: No mitigation measures required.

Impact NOISE-3: Project-related stationary sources and traffic would not result in noise levels that would adversely affect off-site sensitive receptors. (*Less than Significant*)

Significant noise increases are defined to be those that would cause the exterior L_{dn} to exceed 55 dB(A), or cause an exceedance of the interior L_{dn} 45 dB(A) noise standard. Residential neighborhoods in the area affected by project traffic (existing single-family homes along Pepper Tree Lane and multi-family homes along Kaiser Drive) already experience exterior noise levels in excess of 55 dB(A) CNEL/L_{dn}. In areas

where the ambient noise levels exceed 55 dB L_{dn}, as shown in **Table 4.8-5**, an increase in the noise level of 1.5 dB or more would be a substantial permanent increase in ambient noise levels.

Stationary Source Noise

Development of residential land uses would introduce new noise sources on the project site which would increase the ambient noise levels above current noise levels. However, the land uses on the project site are laid in a manner that is sensitive to adjacent land uses. Single-family homes and town homes have been planned adjacent to existing single-family development. Apartments are planned along Kiely Boulevard, at a distance from existing single-family homes along Marietta Drive or Pepper Tree Lane. By planning in this manner, the proposed project reduces the potential for on-site noise to affect off-site receptors. Furthermore, potential on-site noise sources such as two parking garages are planned to be located in the central portions of Parcel 2 at least 250 feet away from the nearest homes on Marietta Drive, with intervening structures between the garages and the nearest off-site homes. In addition, all HVAC equipment is planned for installation on top of the apartment buildings away from the nearest homes. In compliance with the municipal code, this equipment would be acoustically treated to control noise for on-site residents. As a result, nearby off-site residents would also not be exposed to excessive noise from such equipment. Therefore, the proposed project would not result in a significant off-site impact from point source noise associated with the residential uses on the site. The impact of noise from the project's stationary sources on off-site receptors would be less than significant.

Mobile Source Noise

Development of the proposed project would add traffic to existing roadways in the project vicinity. To characterize the increase in traffic noise on these street segments due to the project, noise levels were modeled on area roadways. **Table 4.8-8, Project Generated Cumulative Mobile Source Noise Increases on Area Roadways**, presents modeled noise levels on area roadways under existing without project, and under project conditions (see **Section 4.12, Transportation and Traffic**, for a description of each of these scenarios). Noise levels for each of these scenarios were estimated based on the FHWA Highway Noise Prediction Model and traffic data from the transportation impact analysis prepared for the project (included as **Appendix 4.12** of this EIR). The noise model spreadsheets are included in **Appendix 4.8**.

Table 4.8-7
Project-Generated Mobile Source Noise Increases on Area Roadways

Road	Road Segment	Existing Noise Levels	With Project Noise Levels	Project Contribution	Increase Required for Significant Impact	Potential Significant Impact
Pepper Tree Lane	North of Homestead Road	56.7	58.3	1.6	+ 5.0 dB or more	No
Homestead Road	Pomeroy Avenue to Pepper Tree Lane	68.6	68.9	0.3	+1.5 dB or more	No
Homestead Road	Pepper Tree Lane to Kiely Blvd.	68.0	68.3	0.3	+1.5 dB or more	No
Kaiser Drive	West of Kiely Blvd.	57.1	60.7	3.6	+ 5.0 dB or more	No
Kiely Boulevard	Benton Street to El Camino Real	68.6	68.8	0.2	+1.5 dB or more	No
Kiely Boulevard	Kaiser Drive to Benton Street	68.3	68.6	0.3	+1.5 dB or more	No
Kiely Boulevard	Homestead Road to Kaiser Drive	67.8	68.2	0.4	+1.5 dB or more	No
Kiely Boulevard	Pruneridge Avenue to Homestead Road	66.4	66.6	0.2	+1.5 dB or more	No

Source: Impact Sciences, 2008.

As shown, the project would cause noise levels to increase by 1.6 decibels on Pepper Tree Lane, north of Homestead Road and by 3.6 decibels on Kaiser Drive, west of Kiely Boulevard. However, since ambient noise levels on these segments without the project are less than 60 dB(A) CNEL, the increase would not be considered substantial according to the significance criteria (see **Table 4.8-5**). On the remainder of roadway segments modeled, project traffic would cause noise levels to increase by 0.4 decibel or less, which would not be substantial. Furthermore, traffic-related noise levels from the proposed project would be similar to or less than noise generated by the former hospital uses on the project site. Therefore, project-related traffic would not result in a significant noise impacts to off-site receptors along study roadways.

Mitigation Measure: No mitigation measured required.

Impact NOISE-4: Project construction activities would result in a substantial temporary increase in ambient noise levels that would adversely affect off-site receptors. (Potentially Significant, Less than Significant with Mitigation)

Construction activities typically involve the use of heavy equipment, such as scrapers, tractors, loaders, concrete mixers, cranes, etc. Trucks would be used to deliver building materials and to haul away clearing wastes (i.e., small debris) and construction wastes. Smaller equipment, such as jackhammers, pneumatic tools, saws, and hammers, would also be used during the construction phases. This equipment would generate both steady state and episodic noise that would be heard both on and off the project site.

The US Environmental Protection Agency has compiled data on the noise-generating characteristics of specific types of construction equipment. These data are presented in **Figure 4.8-5, Noise Levels of Typical Construction Equipment**. As shown, noise levels generated by heavy equipment can range from approximately 68 dB(A) to noise levels in excess of 100 dB(A) when measured at 50 feet. However, these noise levels would diminish rapidly with distance from the construction site at a rate of approximately 6.0 to 7.5 dB(A) per doubling of distance for hard and soft sites, respectively. For example, assuming a hard site, a noise level of 68 dB(A) measured at 50 feet from the noise source to the receptor would reduce to 62 dB(A) at 100 feet from the source to the receptor, and further reduce by another 6.0 dB(A) to 56 dB(A) at 200 feet from the source to the receptor.

As a first step, the proposed project would demolish the existing asphalt parking lots and approximately 461,700 square feet of building space on the project site. Demolition work would involve dismantling buildings and removing debris with an excavator with jaws and large concrete breakers. A crusher would be used on site to crush concrete. Non-recyclable debris from demolition would be shredded on site, then hauled to a landfill. Noise levels from operation of the demolition equipment and the crusher could result in an hourly average noise level of 85 dB(A) at a distance 50 feet, which could adversely affect nearby residences (US Department of Transportation 2006b).

Following demolition, the next stage of construction would be site preparation, which usually involves earth moving and compaction of soils. High noise levels during this phase would be associated with the operation of heavy-duty trucks (i.e., trucks with three or more axles), tractors, loaders, backhoes, graders, rubber-tired dozers, and water trucks. Equipment for the proposed project would include bulldozers, large loaders, trucks, graders, water trucks, backhoes, skid steers, and roller compactors. When construction and demolition equipment are operating, noise levels can range from 73 to 96 dB(A) at a distance of 50 feet from individual pieces of equipment. During the third stage of construction, foundation forms would be constructed and concrete foundations would be poured. Primary noise

sources include heavy concrete trucks and mixers, paving equipment, rollers, pavers, forklifts, tractors, loaders, backhoes, cranes, generators, welders, and pneumatic drills. At 50 feet from the source, noise levels in the 70 to 90 dB(A) range are common.

The fourth and fifth stages of construction would consist of interior and exterior building construction and site cleanup. Primary noise sources associated with these phases include hammering, diesel generators, compressors, and light truck traffic. During this stage, noise levels are typically in the 60 to 80 dB(A) range at a distance of 50 feet. The final stages typically involve the use of trucks, landscape rollers, and compactors, with noise levels in the 65 to 75 dB(A) range.

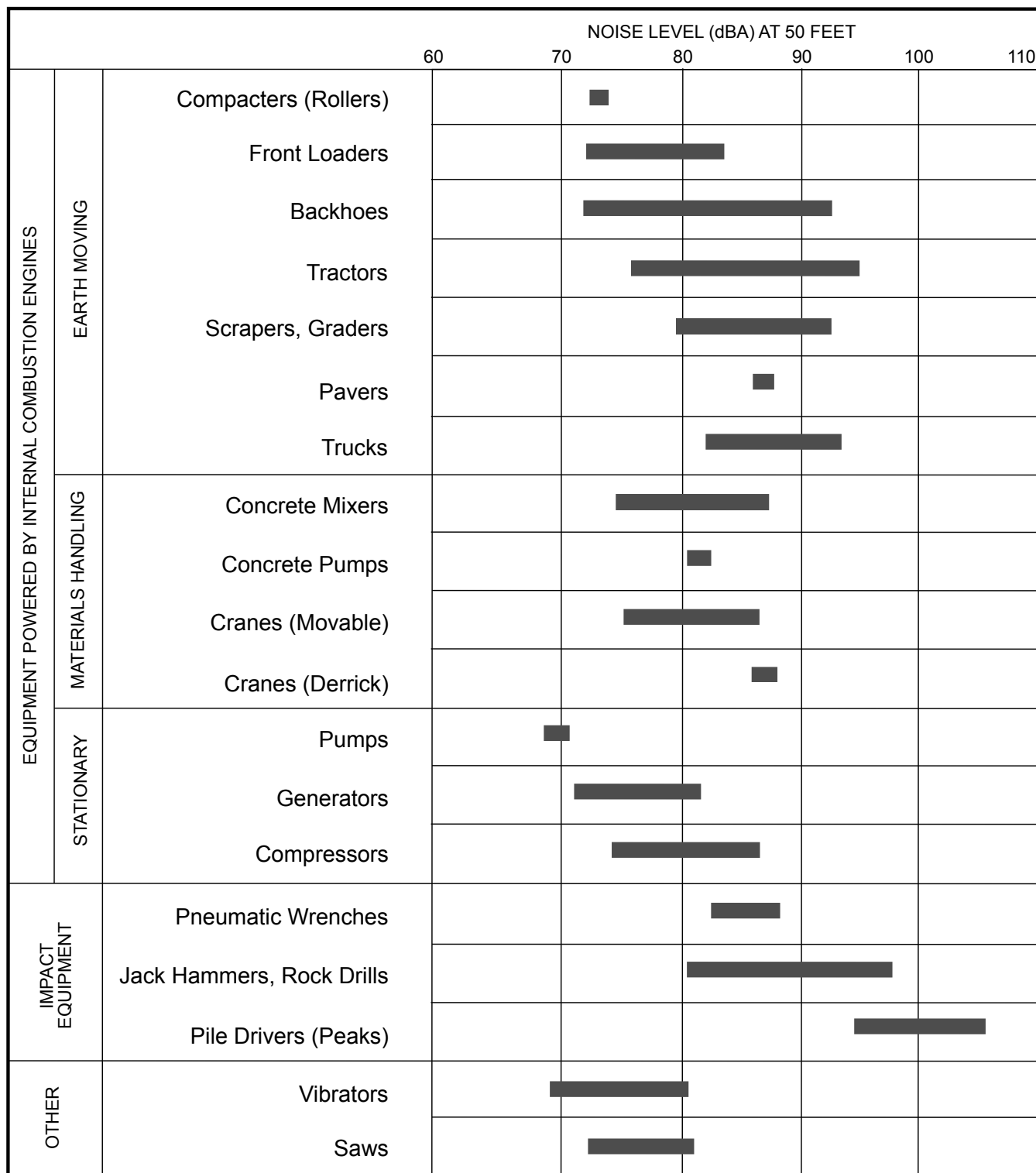
Residents to the north, south, and west of the project site that would have an uninterrupted line of sight to construction noise sources could be exposed to construction noise levels that may exceed the City's exterior noise standards since the site is within 300 feet of a residentially zoned property. However, construction noise is exempt from these standards provided the activities occur between the hours of 7:00 AM and 6:00 PM on weekdays other than holidays, and within the hours of 9:00 AM and 6:00 PM on any Saturday that is not a holiday. The project would comply with the City's noise ordinance and construction would be limited to the days and hours permitted by the City's noise ordinance. Note that compliance with the City's noise ordinance will be made a condition of project approval, and will be monitored by the City. The impact would be potentially significant. To reduce the impact, the following mitigation measures will be implemented.

Mitigation Measure NOISE-4a: During construction activities, the crusher shall be located at least 100 feet away from residences on Marietta Drive and Pepper Tree Lane.

Mitigation Measure NOISE-4b: All construction trucks associated with the proposed project shall be prohibited from accessing or exiting the project site via Pepper Tree Lane or Live Oak Drive.

Significance After Mitigation: Implementation of the above mitigation measures would further reduce less-than-significant noise impacts on off-site residents during project construction.

Impact NOISE-5: **Project construction activities would not expose nearby residents to excessive groundborne vibration. (*Less than Significant*)**



Note: Based on limited available data samples.

SOURCE: United States Environmental Protection Agency, 1971, "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances," NTID 300-1.

FIGURE 4.8-5

Noise Levels of Typical Construction Equipment

Construction activities can cause vibration that varies in intensity, depending on several factors. Of all construction activities, use of pile-driving equipment typically generates the highest groundborne vibration levels. No pile driving is required for this project. Demolition of the hospital building could result in groundborne vibrations. However, due to intervening distance between the hospital building and the nearest off-site residence, vibrations would attenuate to levels that would not cause annoyance or damage. The impact would be less than significant.

Mitigation Measure: No mitigation measures required.

4.8.5.5 Cumulative Impacts and Mitigation Measures

The following analysis evaluates the significance of potential cumulative impacts of the proposed project in conjunction with the approved and pending projects, as listed in **Table 4.0-1, Related Projects**.

The cumulative scenario includes all reasonably foreseeable development, as defined in **Section 4.0, Environmental Setting, Impacts, and Mitigation Measures**, in the City of Santa Clara between 2008 and 2013, in addition to construction of the proposed project. As shown in **Figure 4.0-1**, none of the other reasonably foreseeable projects are in the immediate vicinity of the proposed project and therefore there is no potential for the project's less-than-significant construction noise impacts to cumulate with those from other projects to result in a significant construction noise impact.

Cumulative development would add traffic to the project area roadways which would cause ambient noise levels to increase. **Table 4.8-8, Project-Generated Cumulative Mobile Source Noise Increases on Area Roadways**, identifies the modeled mobile source noise levels on area roadways under existing conditions, long-term without project conditions, and long-term plus project conditions, and also reports the overall noise level increase from existing conditions to cumulative conditions, including the proposed project. Noise levels for each of these scenarios are based on the FHWA Highway Noise Prediction Model and traffic data from the traffic study prepared for the project (Fehr & Peers 2008). The noise model spreadsheets are included in **Appendix 4.8**.

A cumulative noise impact would be significant if the cumulative noise levels increase traffic noise level by 1.5 dB or more where the ambient noise levels exceed 65 dB L_{dn}. Where existing noise levels are below 60 dB(A) L_{dn}/CNEL, a significant cumulative impact would occur if cumulative traffic (including the traffic related to the project) caused noise levels to increase by 5 dB or more.

Table 4.8-8
Project-Generated Cumulative Mobile Source Noise Increases on Area Roadways (in dB(A))

Road	Road Segment	Existing (2008)	Cumulative No Project (2010)	Cumulative With Project (2010)	Increase from Existing Conditions	Project Contribution	Increase Required for Significant Impact	Potential Significant Impact
Pepper Tree Lane	North of Homestead Road	56.7	56.9	58.5	1.8	1.6	+ 5.0 dB or more	No
Homestead Road	Pomeroy Avenue to Pepper Tree Lane	68.6	68.8	69.1	0.5	0.3	+1.5 dB or more	No
Homestead Road	Pepper Tree Lane to Kiely Blvd.	68.0	68.3	68.5	0.5	0.2	+1.5 dB or more	No
Kaiser Drive	West of Kiely Blvd.	57.1	57.2	60.8	3.7	3.6	+ 5.0 dB or more	No
Kiely Boulevard	Benton Street to El Camino Real	68.6	69.3	69.5	0.9	0.2	+1.5 dB or more	No
Kiely Boulevard	Kaiser Drive to Benton Street	68.3	69.0	69.2	0.9	0.2	+1.5 dB or more	No
Kiely Boulevard	Homestead Road to Kaiser Drive	67.8	68.6	68.9	1.1	0.3	+1.5 dB or more	No
Kiely Boulevard	Pruneridge Avenue to Homestead Road	66.4	67.1	67.3	0.9	0.2	+1.5 dB or more	No

Source: *Impact Sciences, 2008.*

As shown in **Table 4.8-8**, all roadway segments currently experience noise levels above 55 dB (A) L_{dn}/C_{NEL} . Cumulative traffic, including traffic added by the project, would not substantially increase noise levels. Receptors along these roadway segments would not experience a significant cumulative impact related to traffic noise.

4.8.6 REFERENCES

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